

# Wing Feathers



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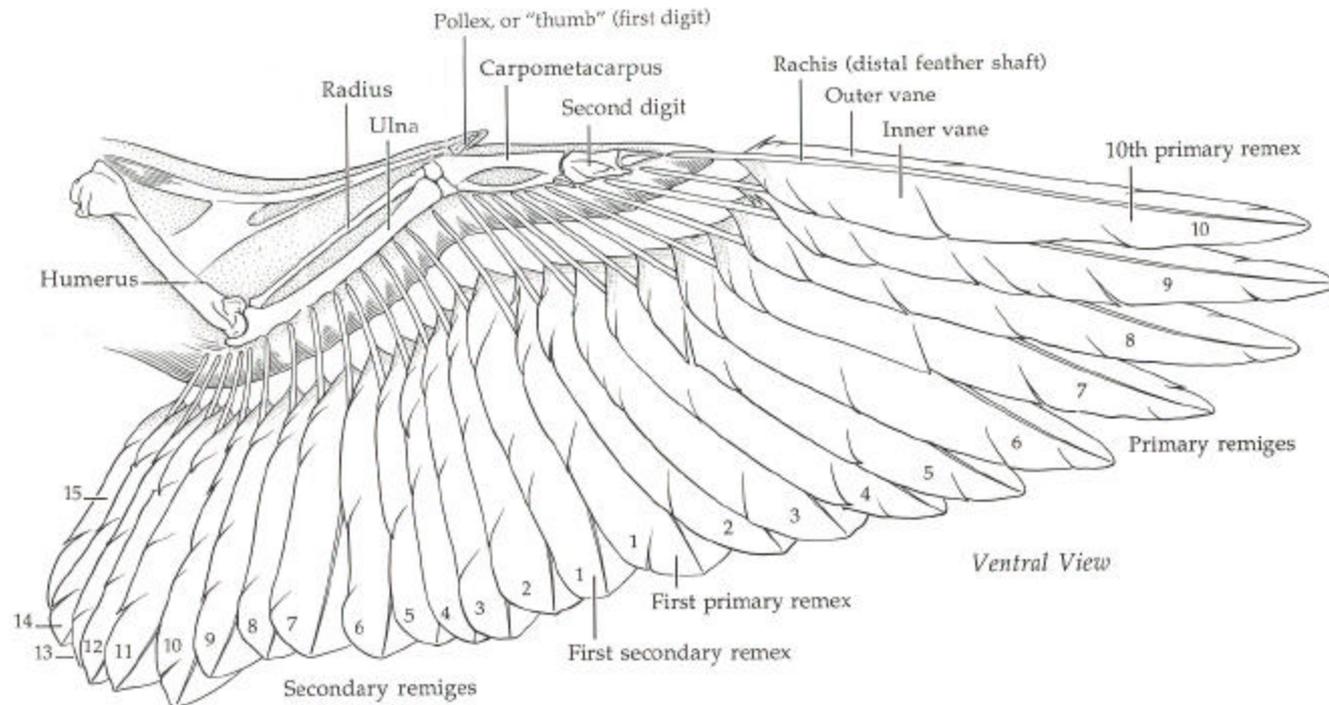
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# Introduction

- **PURPOSE:** To provide an introduction to the topography of the avian wing, to the form and function of wing flight feathers, and to the use of flight feathers for determining minimum number of individuals (mni).
- **INSTRUCTIONS:** This ID Note can be stored on the users' computer as a PowerPoint file and viewed onscreen or projected as a presentation. It can also be printed (in landscape orientation) and used as a hard copy.
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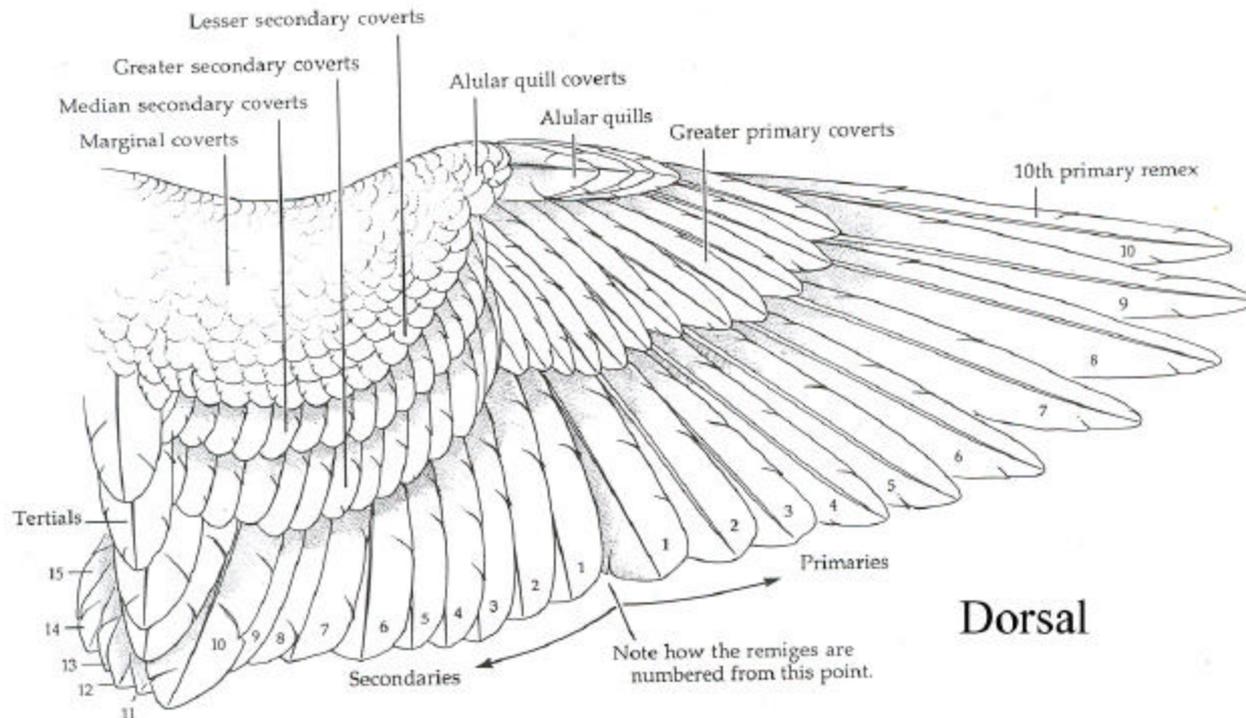
The wing flight feathers, or remiges, consist of the primaries (usually 10, but 9 in some songbirds) and the secondaries (varying from 9-25 depending on the length of the wing). The primaries are the outer flight feathers, and are attached to the bones of the “hand.” The secondaries are the inner flight feathers, and are attached to the ulna bone in the bird’s “forearm.”



In addition to the primaries and secondaries, all bird wings have a small cluster of stiff feathers, the alula, attached to the thumb bone. The alula provides a forward slot, increasing lift and maneuverability.

Each primary and secondary feather has its own number. Primaries are numbered from the innermost outwards. Secondaries are numbered from the outermost inwards (see diagram). This numbering reflects the molt pattern, which begins with the inner primary and outer secondary.

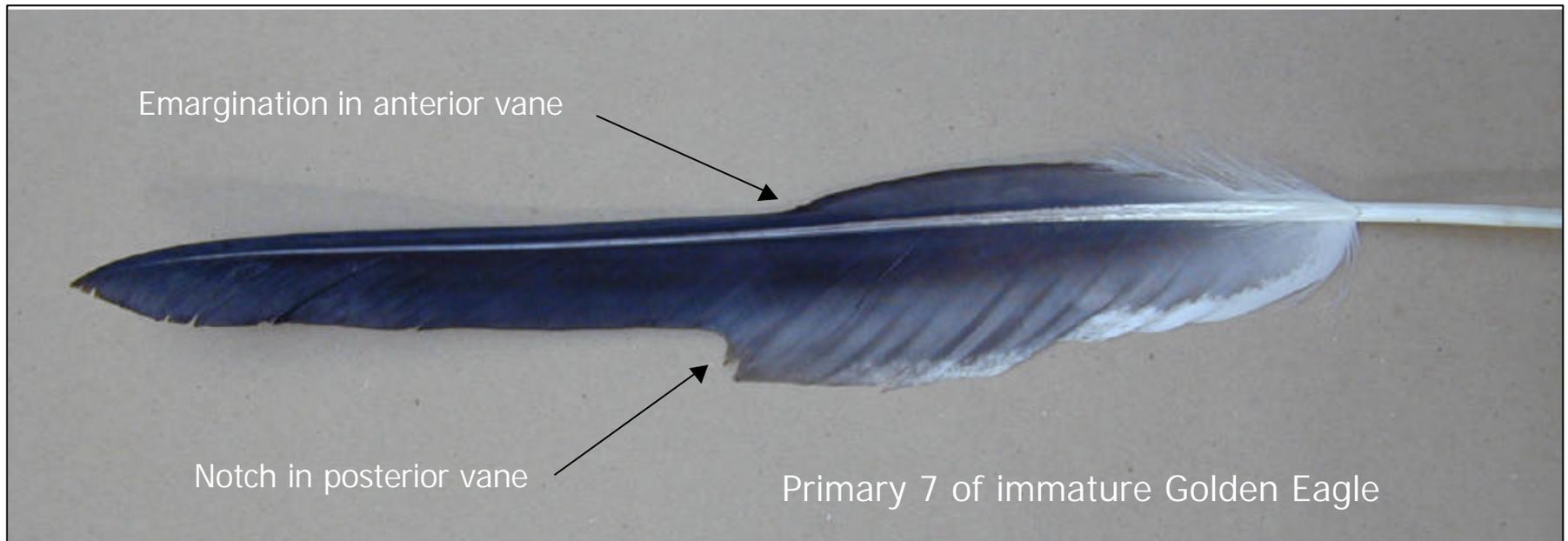
Proctor, N.S. & Lynch, P.J. 1993. Manual of Ornithology: Avian Structure & Function. Yale Univ. Press.



The primaries differ in shape depending on their position in the wing, with the outer primaries being relatively narrow and stiff, and the inner primaries being broader. This reflects the function of the feathers: the outer primaries meet the air first, and must provide wind resistance and maneuverability. The inner primaries (and secondaries) overlap broadly to provide a smooth lifting surface.



In large soaring birds, the outer primaries have elongated narrow tips formed by a “notch” in the posterior (trailing) vane and emargination in the anterior (leading) vane. This produces the characteristic “fingers” visible at the end of the wings of a soaring bird. The elongated tips provide slots that increase lift as air is forced through the narrow gaps.



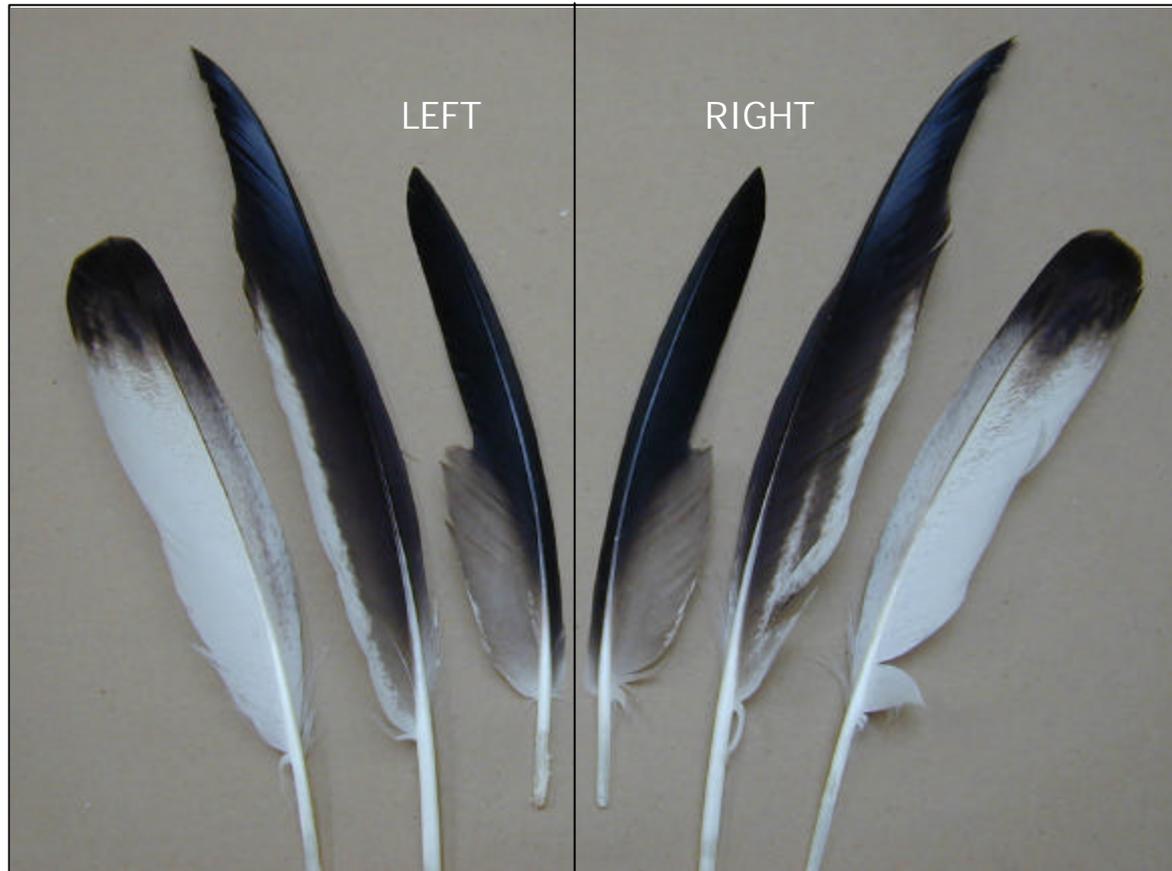
The obvious differences in size and shape among the outer primaries makes these feathers very useful for the determination of **minimum number of individuals**, or mni. Note how the position of the anterior emargination and posterior notch changes gradually as you move inward along the wing.

The small outermost primary (P10) has no emargination in its narrow, stiff anterior vane. As you move inward, the posterior notches become less obvious, and the anterior vanes develop wider bases which gradually increase in length. Together, these changes reduce the relative length of the narrow tips.



Outer primaries (P5-P10)  
of immature Golden Eagle

The left and right wing feathers of the same individual are symmetrical in size and shape, though they may differ slightly in pattern. The photo below shows primaries 1, 5, and 10 from the left and right wings of a single immature Golden Eagle. Note the mirror-image similarity in size and shape, but also note how the pattern of left and right P5 are slightly different.



MNI Case Example: this evidence item contained 37 outermost primaries (P10's). Analysis confirmed that 34 of these feathers were from Golden Eagle (the three inside the dashed rectangle were Bald Eagle). Dividing these into left and right revealed 18 right P10's and 16 left P10's. Therefore, mni for Golden Eagle in this item = 18.



## References

Gill, F.B. 1995. Ornithology, 2nd Edition. W.H. Freeman and Company, New York.

Proctor, N.S. & P.J. Lynch. 1993. Manual of Ornithology: Avian Structure and Function. Yale University Press, New Haven.

Welty, J.C. & L.F. Baptista. 1988. The Life of Birds, 4th Edition. Saunders College Publishing, New York.